DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4, 6-11, 14-18, 20-26 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Champlin et al. (U.S. Patent Number 6,172,483) and further in view of Ding et al. (U.S. Patent Number 6,094,033).

3. Claims 1 and 14: Champlin teaches evaluating a transition frequency of impedance for a battery, which is excited by an alternating current (Col.3, Lines 12-14), wherein the transition frequency is a frequency of the alternating current at which the imaginary part of the impedance of the battery vanishes (Col.3, Lines 66-67), it teaches this gives the battery resistance. Champlin teaches the components of the complex impedance are used to gain insight into SOC (Col.1, Lines 10-19).

Champlin does not explicitly teach assigning the transition frequency to the state of charge of the battery.

Ding teaches assigning the transition frequency to the state of charge of a battery (Col.6, Lines 23-28).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have had the teachings of Ding in the device of Champlin

because it is known in the art to obtain SOC based on the batteries internal resistance (Col.6, Lines 23-28).

4. Claims 2 and 15: Champlin and Ding teach the limitations of claims 1 and 14 as discussed above. Champlin teaches exciting the battery (10) by noise signals which are generated by an alternating current source (5) contained in the power net (Col.3, Lines 12-14).

5. Claims 3 and 16: Champlin and Ding teach the limitations of claims 1 and 14 as discussed above. Champlin teaches measuring the alternating voltage drop at the battery (Col.10, Lines 43-47).

6. Claims 4 and 17: Champlin and Ding teach the limitations of claims 1 and 14 as discussed above. Champlin teaches measuring the intensity of the alternating current flowing through the battery (Col.10, Lines 30-32).

7. Claim 6: Champlin and Ding teach the limitations of claim 1 as discussed above. Champlin teaches determining the transition frequency of the alternating current (Col.3, Lines 66-67).

8. Claim 7: Champlin and Ding teach the limitations of claim 1 as discussed above. Champlin teaches determining the complex impedance of the battery (Col.4, Lines 23-24).

9. Claim 8: Champlin and Ding teach the limitations of claim 1 as discussed above. Champlin teaches determining the frequency of the alternating current, at which an imaginary part of the impedance vanishes (Col.3, Lines 66-67).

10. Claim 9: Champlin and Ding teach the limitations of claim 1 as discussed above. Champlin teaches varying a frequency of the alternating current, exciting the battery (Col.3, Lines 2-5 and 12-14).

11. Claims 10 and 25: Champlin and Ding teach the limitations of claims 1 and 14 as discussed above. Ding teaches the assignment of the transition frequency to the state-of-charge is a function of the operating temperature of the battery (Col.6, Lines 32-38).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have had the teachings of Ding in the device of Champlin because it is known in the art to use temperature information in the SOC determination (Col.6, Lines 32-38).

12. Claims 11 and 26: Champlin and Ding teach the limitations of claims 1 and 14 as discussed above. Ding teaches the assignment of the transition frequency to the state-of-charge is a function of an intensity of a direct current flowing through the battery (Col.6, Lines 51-58).

13. Claim 18: Champlin and Ding teach the limitations of claim 14 as discussed above. Champlin teaches the element for determining of the transition frequency comprises at least a variable frequency filter for filtering the measured current and voltage signals (Col.7, lines 62-67) (Col.8, Lines 11-13).

14. Claim 21: Champlin and Ding teach the limitations of claim 14 as discussed above. Champlin teaches the element for determining the transition frequency comprises a unit for the Fourier Transformation of the measured current and voltage signals (Col.11, Lines 11-17).

15. Claim 22: Champlin and Ding teach the limitations of claim 14 as discussed above. Champlin teaches the element for determining of the transition frequency comprises an analysis unit for analyzing the transformed signals and determining a frequency for which an imaginary part of an impedance of the battery vanishes (Col.6, Lines 64-67).

16. Claim 23: Champlin and Ding teach the limitations of claim 14 as discussed above. Ding teaches a sensor for measuring an operating temperature of the battery (Col.6, Lines 32-38).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have had the teachings of Ding in the device of Champlin to use it in SOC determination (Col.6, Lines 32-38).

17. Claim 24: Champlin and Ding teach the limitations of claim 14 as discussed above. Ding teaches a sensor for measuring the intensity of a direct current flowing through the battery (Col.6, Lines 51-58).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have had the teachings of Ding in the device of Champlin to use it in SOC determination (Col.6, Lines 51-58).

18. Claim 28: Champlin and Ding teach the limitations of claim 14 as discussed above. Ding teaches a display device for displaying the state-of-charge of the battery (Col.6, Lines 47-50).

19. Claims 5 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Champlin et al. (U.S. Patent Number 6,172,483) and Ding et al. (U.S. Patent Number

6,094,033) as applied to claims 1 and 14 above, and further in view of Dowgiallo, Jr. et al. (U.S. Patent Number 3,984,762).

20. Claim 5: Champlin and Ding teach the limitations of claim 1 as discussed above. They do not explicitly teach determining a phase difference between a phase of an alternating voltage and a phase of the alternating current.

Dowgiallo, Jr. teaches determining a phase difference between a phase of an alternating voltage and a phase of an alternating current (Col.2, Lines 61-66).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have had the teachings of Dowgiallo in the device of Champlin to obtain the state of charge of batteries (Col.2, Lines 13-15).

21. Claim 19: Champlin and Ding teach the limitations of claim 14 as discussed above. They do not explicitly teach the element for determining of the transition frequency comprises a phase comparator, which determines the phase difference between the filtered current and voltage signals.

Dowgiallo, Jr. teaches determining a phase difference between a phase of an alternating voltage and a phase of an alternating current (Col.2, Lines 61-66).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have had the teachings of Dowgiallo in the device of Champlin to obtain the state of charge of batteries (Col.2, Lines 13-15).

22. Claims 12-13 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Champlin et al. (U.S. Patent Number 6,172,483) and Ding et al. (U.S. Patent

Number 6,094,033) as applied to claims 1 and 14 above, and further in view of Koch et al. (U.S. Publication Number 2003/0112010).

23. Claims 12 and 27: Champlin and Ding teach the limitations of claims 1 and 14 as discussed above. They do not explicitly teach the assignment of the transition frequency to the state-of-charge is a function of the aging status of the battery.

Koch teaches a function taking into consideration SOC and aging of the battery (Par.39).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have had the teachings of Koch in the device of Champlin to have obtained the SOC based on the aging of the batteries. One of ordinary skill in the art can solve the function for any of its components.

24. Claim 13: Champlin and Ding teach the limitations of claim 1 as discussed above. They do not explicitly teach determining an aging status of the battery.

Koch teaches determining the aging status of a battery (Par.47).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have had the teachings of Koch in the device of Champlin to have used it to determine if the battery would be able to start an engine (Par.49).

25. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Champlin et al. (U.S. Patent Number 6,172,483) and Ding et al. (U.S. Patent Number 6,094,033) as applied to claim 14 above, and further in view of Freeman et al. (U.S. Patent Number 6,519,539).

26. Champlin and Ding teach the limitations of claim 14 as discussed above. They do not explicitly teach the element for determining the transition frequency comprises a control unit, which scrutinizes the phase difference and modifies a transmitted frequency of the frequency filter and/or a frequency of the alternating current source, till the phase difference is null.

Freeman teaches varying the frequency of an alternating current and measuring determining at which frequency the imaginary part is null (Col.4, Lines 47-61).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have had the teachings of Freeman in the device of Champlin to determining the real component of a complex impedance (Col.4, Lines 39-42).

Conclusion

27. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHALI A. TORRES RUIZ whose telephone number is (571)270-1262. The examiner can normally be reached on M- Alternating F 7:30am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Akm Ullah can be reached on (571) 272-2361. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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